Lingyun Zhong

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EDUCATION

University Of Michigan, Ann Arbor — Ann Arbor, USA
Master of Science in Transportation System Engineering — *Aug. 2023 – Present (Dec. 2024)*

Tongji University — Shanghai, China
Bachelor of Engineering in Transportation Engineering — *Aug. 2019 – June. 2023*

PUBLICATION AND PATENT

Journal & Conference Publications

- **Lingyun Zhong**, Meiting Tu, Ye Li. "Enhancing the Carbon Reduction Potential in Ride-splitting through Reinforcement Learning: A Case Study in Chengdu." Transportation Research Board 103rd Annual Meeting. 2024.

Under Review & Preprint

- **Lingyun Zhong**, Taewhan Ko, Meiting Tu, Dominique Gruyer, Tongtong Shi. "Unveiling the Heterogeneity of Vehicle Purchasing Choices among Car-owning Households: A Comprehensive Analysis Using Machine Learning and Logit Models". [Submitted to Transportation Research Part F]
- **Lingyun Zhong**, Meiting Tu, Ye Li, Dominique Gruyer, Mahdi Zargayounamahdi. "Eco-Friendly Ride-splitting: A Dispatch Framework Incorporating Reinforcement Learning and Share-ability Networks". [Preprint]

Working Paper

- Federated Reinforcement Learning for Adaptive Traffic Signal Control in a hierarchical framework [Plan to submit to Transportation Research Part C]
- Sequential Career Decision Modeling with Inverse Reinforcement Learning.

Patent

- Cong Zhao, **Lingyun Zhong**, Shirui Wang and Yuchuan Du. 2022. Global vehicle track construction method under incomplete sensing data. CN Patent Application CN 115205334A, filed Jun 2022. Patent Pending.[Website](**First Student Author**)

RESEARCH EXPERIENCE

Sequential Career Decision Modeling with Inverse Reinforcement Learning — *MIT, JTL Lab*
R.A. | Advisor: Jinhua Zhao, Shenhao Wang, Haris Koutsopoulos, Yunhan Zheng, Yuebing Liang — *May. 2024 - Present*

- Proposed a ChatGPT-powered framework for occupational and major title standardization, utilizing DistilBERT embeddings for semantic analysis and fuzzy string matching for text similarity.
- Employed ICA-transformed embeddings for text semantic matching, enhancing stability and interpretability in text matching algorithms.
- Constructed an Adversarial Inverse Reinforcement Learning (AIRL)-driven framework for career trajectory recommendations, analyzing user career state transitions and feature distributions through a reward network.

Federated Reinforcement Learning for Adaptive Traffic Signal Control — *Columbia University, DitecT Lab*
R.A. | Advisor: Xuan Sharon Di, Yongjie Fu — *Mar. 2024 - Present*

- Enhanced the SUMO-based simulation environment with RL-Lib and Gym, incorporating road network construction, turning ratio configurations, and random traffic flow generation.
- Implemented a personalized federated reinforcement learning framework for ATSC, integrating FedCluster and FedFomo with A3C algorithms.

Distributed Road Traffic Flow Prediction based on Federated Learning *Umich, NGMS Lab*
Independent Study | Advisor: Neda Masoud, Ethan Zhang *Dec. 2023 - Present*

- Processed NYC traffic flow and NGSIM data across multiple segments, imputing missing values and conducting sampling to curate a training dataset.
- Developed distributed traffic flow prediction models leveraging MLP, CNN, LSTM, and GRU architectures based on the Flower federated learning framework.

Reducing the Carbon Emission in Ridesplitting through Reinforcement Learning *Tongji University*
Undergraduate Thesis | Advisor: Meiting Tu, Ye Li *Sep. 2022 - Jul. 2023*

- Utilized an algorithm for identifying ride-splitting probabilities using a vehicle-shareability network, framing the matching as a maximum weighted independent set problem to optimize economic and environmental benefits.
- Developed a reinforcement learning algorithm to assess the value of ride-splitting orders, factoring in immediate rewards and future expected values. Additionally, proposed an accelerated maximum weighted independent set algorithm for efficient ride-splitting order matching.

Global Vehicle Track Construction Method under Incomplete Sensing Data *Tongji University, STEPS Lab*
R.A. | Advisor: Yuchuan Du, Cong Zhao *Nov. 2021 - Jul. 2022*

- Constructed a data processing system using YOLOv3 to extract vehicle trajectory data from camera sensors, and developed a vehicle ID bipartite graph matching algorithm based on headway characteristics, tailored for vehicle ID matching in both camera and radar coordinate systems.
- Implemented the AI CITY 2021 award-winning Re-ID algorithm, integrating road environment features for vehicle ID matching across diverse sensor modalities.

SKILLS

Programming Language: Python, Matlab
Package & **Tools**: PyTorch, TensorFlow, Scikit-learn, Numpy, Pandas, Gurobi, Matplotlib
Others: SPSS, LaTex, ArcGIS

AWARDS

The First Prize Scholarship (Top 5%) *Sep. 2022*
Tongji University

The First Prize (Rank 3/1473) *Jul. 2022*
The 17th National College Student Transportation Science and Technology Competition

The First Prize (Rank 1/78) *May. 2022*
The 21st Tongji University Transportation Science and Technology Competition

The Second Prize Scholarship (Top 15%) *Sep. 2021*
Tongji University

AFFILIATIONS

The Innovation Club of Student Union of The Transportation Department *Sep. 2020 - Sep. 2021*
The Red Cross Society of Tongji University *Sep. 2019 - Sep. 2020*